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On the Forms of Spectral Lines Observed in the Planetary Nebulae N. G. C. 7662 and N. G. C. 2392, by W. W. Campbell and J. H. Moore.

Results are given of a study of the interesting phenomena of the doubled spectral lines in the central portions of the two planetaries N. G. C. 7662 and N. G. C. 2392, in which the observed effects are quite marked. Several hypotheses to account for the forms of these lines are examined in the light of the observational data.

On Certain Asteroid Observations Reported by Metcalf in December, 1916, by A. O. Leuschner.

A discussion is given of the computations which have been made in the effort to secure an orbit which will satisfy the observations mentioned.

Note on Comet *b* 1916 (Wolf), by R. T. Crawford.

From the residuals secured by comparing recent observations by Gallo, Aitken, and Barnard with the orbit of this comet computed by the author and D. Alter it is shown that the orbit represents the comet's motion with great accuracy. This result upholds the author's contention that the orbit could not be a short period ellipse, as was at first announced.

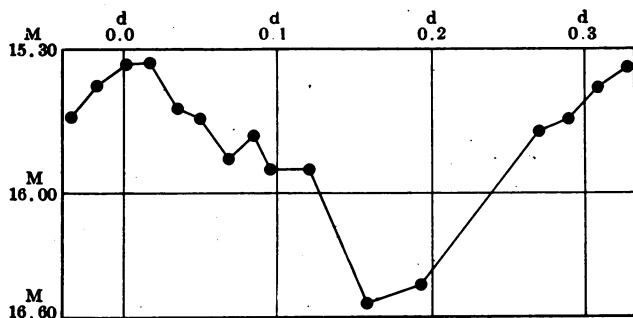
Long Period Variable Stars, by S. D. Townley.

The paper comprises a résumé of our present knowledge of the long period variable stars and a discussion of the various theories bearing upon them.

LIGHT ELEMENTS OF VARIABLE NO. 37 IN MESSIER 3.

In a recent Harvard Circular (No. 193) Professor Bailey calls attention to the existence of a very significant relationship in the length of period among the different sub-types of variables in the globular clusters Messier 5 and ω Centauri. The duration of the cycle of variation of those stars for which the light curves approximate sine curves is unusually short, and is, on the average, only one-half the mean period of another group of typical variables in each system. Bailey also finds one probable case of a peculiarly short period

among the 150 variables of Messier 3. As some fifty photographs of this cluster are available at Mount Wilson, the magnitudes of the star in question (variable No. 37) have been derived, adopting the Harvard values of the comparison stars, and a solution has been made for the elements of light variation. Including the data published at harvard (*Harvard Annals*, 78, 22, 40, 1913), the total interval of observation



PHOTOGRAPHIC LIGHT CURVE OF VARIABLE
No. 37 IN MESSIER 3.

covers twenty-one years and nearly thirty epochs of maxima are recorded. The formula

$$\text{Max.} = \text{J. D. } 2415021.075 + 0^d.326345E, \text{ G. M. T.,}$$

satisfactorily represents all observations of No. 37, with the exception of those of 1897 when the maxima occurred systematically two or three hours too early. There can be little doubt of the general correctness of the formula or of the existence of the perturbation, but the data are insufficient to evaluate the large variation. The period suggested by Bailey differs by less than a second from the one given above. With the exception of a few stars in Messier 5, for which the data have not yet been published, there are only two or three variables known to have periods shorter than this.

There is good evidence that the shape of the light curve at maximum is not constant; but there are too few observations in minimum light to test for inequalities at alternate epochs. The mean light curve, shown in the accompanying figure, is based upon forty-nine Mount Wilson photographs and indi-

cates that this variable resembles the shortest period variables of α Centauri in the relatively small range and in the shape of the light curve. The nearest approach to this type of star among the isolated Cepheid variables is probably represented by XX Cygni and β Cephei. The former has a period about one-fourth that of the typical cluster-type variable, and the latter has a period about one-third the usual length.

HARLOW SHAPLEY.

TWO STARS WITH BRIGHT HYDROGEN LINES.

The following two stars have been found to have bright hydrogen lines in their spectra:

	α (1900)	δ	Mag.	Spectrum
Groom 515	$2^h 24^m.5$	$+70^\circ 32'$	8.0	B 4
Boss 1215 (105 Tauri)	5 1.9	$+21^\circ 34'$	6.0	B 5

In both stars $H\beta$ is a strong bright line showing a trace of a dark reversal thru the center; $H\gamma$ is hardly visible, being evidently in a balanced condition between dark and bright, and $H\delta$ is dark.

W. S. ADAMS

A. H. JOY.

NOTE ON THE SPECTRUM OF α CETI.

A number of spectrograms of α Ceti have been obtained in the past few months during its gradual decrease in brightness, the main object in view being to examine the behavior of the lines used in determinations of absolute magnitude. The enhanced line of strontium at λ 4215 proves to be of especial interest. On a photograph taken in November, this line was very prominent having more than half the intensity of the corresponding line in α Orionis. It grew fainter rapidly, however, and on a recent photograph was hardly visible. The "low magnitude" line at λ 4455 has increased somewhat in intensity but observations are difficult on account of the presence of absorption bands. There is a general decrease in intensity of all enhanced lines in the spectrum during the fading of the star's light.